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मानक

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“Step Out From the Old to the New”

IS 9975-2 (1984): Specification for 'O' Rings, Part 2:
Material Selection and Quality Acceptance Criteria [MED 30:
Gaskets and Packing]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

(Reaffirmed 1999)

SPECIFICATION FOR 'O'-RINGS

PART 2 MATERIAL SELECTION AND
QUALITY ACCEPTANCE CRITERIA

1. Scope — Covers the material, selection requirements, and quality acceptance criteria for 'O'-Rings for reciprocating and static purposes.

2. Material — The elastomeric compound used for the manufacture of 'O'-ring shall be of suitable grade satisfying the requirements of finished products.

2.1 Guidelines for the selection of suitable elastomeric compounds are given in Appendix A. However, this recommendation does not restrict the use of other compounds suitable for manufacturing 'O'-rings of required quality.

3. Quality Acceptance Criteria

3.1 Tests — All test procedures shall be as in the relevant parts of IS : 3400 'Methods of tests for vulcanized rubbers'. The tests shall be carried out from the finished products wherein practicable or from prepared test slabs of approximately same degree of vulcanization and using the same compounds.

3.2 Workmanship and Finish — The surface of the 'O'-rings shall be smooth, free from air bubbles and other moulding defects.

3.2.1 The various categories of surface imperfections on 'O'-rings are detailed below and the maximum acceptable limits for surface imperfections on 'O'-rings are given in Table 1.

a) Off register — Misaligned 'O'-ring halves caused by the lateral shift of one mould cavity plate relative to the other.

a₁) Mismatch — The cross sectional radius in one ring half unequal to that of the other half. It is caused by the dimensional differences in mould halves.

b) Flash — A film like material, which extends from parting line projection in ID and OD. It is caused by the mould separation or inadequate trim.

c) Backrind — A longitudinal recess of wide angle 'V' or 'W' like cross sections oriented circumferentially and located at parting lines.

c₁) Parting line indentation — A shallow saucer like recess, sometimes triangular in shape, located on the parting line at ID and OD which is caused by deformation of mould edge at parting lines.

d) Excessive trimming — A flat and often roughened area around ID and/or OD of an 'O'-ring caused by the trimming process.

e) Flow marks — A thread-like recess, usually curved, of very slight depth in the unflexed state with the normal surface texture and rounded edge. It is caused by incomplete flow and knit of the material.

f) Non-refills, air pockets — A randomly spaced irregular shaped surface indentation having a coarser texture than the normal 'O'-ring surface or caused by the removal of foreign material.

f₁) Foreign material — Any extraneous embedded matter (contamination, dirt, etc).

f₂) Mould deposit indentation — Surface indentation, irregular in shape with rough surface texture caused by build up of hardened deposits adhering to the mould cavity.

Adopted 21 December 1984

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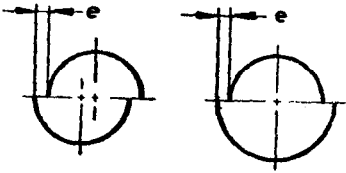
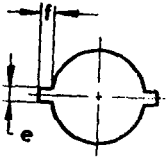
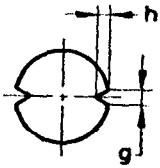
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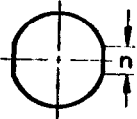
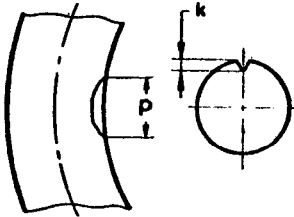
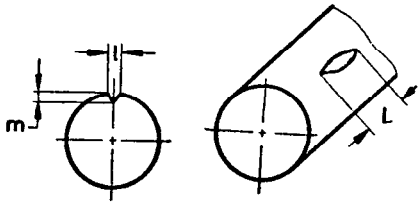
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TABLE 1 MAXIMUM ACCEPTABLE LIMITS FOR SURFACE IMPERFECTIONS ON 'O'-RINGS
(Clause 3.2.1)

All dimensions in millimetres.

Categories of Surface Imperfections	Illustration (Schematic)	Dimension of Surface Imperfection	Cross-Section Diameter d_s				
			1·80	2·65	3·55	5·30	7·00
Off-register and mismatch		e	0·08	0·10	0·13	0·15	0·15
Flash		f	0·08	0·10	0·13	0·15	0·16
Backrind/parting line indentation		Width g	0·13	0·27	0·36	0·53	0·70
		Depth h	0·08	0·08	0·10	0·10	0·13

Excessive trimming		n	n is permitted as long as d_2 is within the tolerance				
Flow marks		Length p (Circumfer initial)	1.5 Max	(1.5 Min)	$0.05 \times d_1$ (6.5 Min)	(6.5 Min)	(6.5 Min)
		Depth k	0.08				
Non fill, air pockets, foreign materials, mould deposit indentations		Width l	0.80	0.80	1.00	1.30	1.70
		Depth m	0.07	0.08	0.10	0.10	0.10
The above maximum acceptable limits shall apply also to non-standard ranges of d_1		Greater than to	—	2.24	3.15	4.50	6.30
			2.24	3.15	4.50	6.30	8.00

APPENDIX A

(Clause 2.1)

MATERIAL PROPERTIES AND SELECTION GUIDE LINES

Material Class	Specification of Compound	Hardness (Shore A)	Maximum Pressure (kgf/cm ²)	Temperature Range (°C)	Tensile Strength kg/cm ²	Advantages	Disadvantages	Application	Remarks
A	Nitrile-butadiene	75 ± 3	105	-30 to +130	100 to 200	1. Low swelling	1. Lack of exceptional heat resistance 2. Tendency to harden during high temperature usage	For general use in retaining lubricants and excluding mud, dirt, water, etc. High pressure hydraulic and lubricating oil pumps, water lines, gaslines. Compressors, general equipments	Cheap for normal use Standard quality
B	Nitrile-butadiene	85 ± 3	210			2. Fair dry running characteristics 3. Good processing characteristics 4. Good low temperature characteristics			
C	Vinylidene fluoride and hexafluoropropylene copolymer (viton)	90 ± 3	350	-25 to +200	100 to 150	1. Good moderate temperature performance 2. Low swelling 3. If the shaft run out is low these may be used at low temperature	1. Poor low temperature properties 2. Poor dry running characteristics	Chemical equipments hydraulic oils with additives and all above applications	Medium cost range
D	Teflon (polytetrafluoroethylene)	98 ± 1	350	-200 to +200	200 to 350	1. Good heat resistance 2. Excellent low temperature properties	—	Refrigerants oxygen, aggressive fluids	Extensive, highly abrasionless elastic
E	Silicon compounds—semi organic elastomers	60 to 80 ± 5	105	-50 to +175	50 (Min)	1. Good heat stability 2. Good low temperature properties 3. Low shrinkage factor 4. Low setting properties	The maximum usable temperature is limited by decomposition temperature of lubricants	In general equipments, automobile sealing, etc	High cost range

4. Marking

4.1 The 'O'-rings shall be marked with the following:

- a) Manufacturer's name or trade-mark;
- b) Size code identification as in IS : 9975 (Part 1)-1981 'Specification for 'O'-rings: Part 1 Dimensions'.

4.2 *Certification Marking* — Details available with the Bureau of Indian Standards.

5. Sampling

5.1 *Lot* — The 'O'-rings of same cross section and size code belonging to the same consignment shall constitute a lot.

5.2 Unless otherwise agreed between the buyer and the seller, the 'O'-rings shall be selected from a lot at random for inspecting dimensions. To ensure the randomness of selection, procedure given in IS : 4905-1968 'Methods for random sampling' shall be followed.

5.3 The sampling inspection plan shall conform to IS : 2500 (Part 1)-1973 'Sampling and inspection tables: Part 1 Inspection by attributes and by count of defects (*first revision*)'. The specific sampling plan shall be as agreed to between the manufacturer and the purchaser.

6. Other Requirements

6.1 *Dimensions* — The dimensions of 'O'-rings shall be as given in IS : 9975 (Part 1)-1981.

6.2 *Seal Housing Dimensions, Tolerances and Design Criteria* — shall be as given in IS : 9975 (Part 3)-1984 'Specification for 'O'-rings: Part 3 Seal housing dimensions and tolerances and design criteria for standard application'.

6.3 *Terminology and Definitions of Terms* — The terminology and definitions of terms used in this standard shall be as given in IS : 9975 (Part 4)-1984 'Specification for 'O'-rings: Part 4 Terminology and definitions of terms'.

EXPLANATORY NOTE

To obtain a reasonable life from 'O'-rings at high temperatures, the working conditions become of the greatest importance and it is strongly recommended that the users consult the manufacturer to ensure that all factors are considered and correct compound chosen.

In formulating this standard due consideration has been given to the indigenous availability of raw materials and the need to cast the specification more on physical test basis rather than chemical tests.

Considerable assistance has been derived from the following sources in preparation of this standard:

- a) IRSS/R61-76 — Indian Railway Standard Specification for moulded silicon rubber seals.
- b) IPSS/1-02-001/April 1975 — Interplant Standard — Steel Industry — Specification for 'O'-rings — Dimensional tolerances and guidelines for selection.
- c) ISO/3601 — Part III — Fluid Systems — 'O'-rings Quality Acceptance Criteria — International Organization for Standardization.

The other standards in the series related to 'O'-rings are:

Part 1 Dimensions

Part 3 Seal housing dimension and tolerances and design criteria for standard application

Part 4 Terminology and definition of terms